

1. RIT Overview

AOS's standardization effort to commonize and modernize the FAA's radar analysis tasks and methods via software tools and personal computers (PC) was initiated in 1991 under the CIP 56-41, The Radar Intelligent Tool (RIT, pronounced: /writ/) Project and the Enhanced - Radar Intelligent Tool (E-RIT, pronounced: /ee-writ/) Project.

RIT Project

The RIT Project is the FAA's effort to rehost all FAA radar analysis algorithms to a Microsoft DOS/Windows™3.1 PC platform. AOS-520's objective is to standardize the radar analysis algorithms and to make available as many radar analysis functions as possible to the radar analyst in a single operating environment.

RIT System Hardware

A RIT System is a commercial off the shelf personal computer, Windows compatible. A desktop, lunchbox or notebook type PC will be able to execute the RIT Analysis Tools.

Each RIT System is outfitted with a radar data capture system (the MX-6A Card or the RDI System) to record radar data to hard disk or any PC secondary storage medium. A Windows compatible black and white, wide carriage, near-letter quality printer is used to print hardcopies of radar analysis summaries.

Software required:

System operation (COTS):

1. MS DOS
2. SCSI device drivers
3. MS Windows™3.1

Management reports (COTS):

1. MS Word v6.0
2. a screen capture utility for including screen images in reports

Housekeeping (COTS):

1. a backup utility for system backups
2. a hard drive maintenance utility

Radar Analysis Tools (GFE):

1. TRACS-9 software suite - DOS based
2. *NEW!* RAV - Radar Analysis Visual suite

RAV - Radar Analysis Visual Suite



FIGURE 1. -1 RAV LOGO

Radar Analysis Tools

All of the various FAA radar analysis programs and functions (HOST, UNIX, and DOS based) are currently being redeveloped for the Microsoft Windows™3.1 environment. This software development effort is referred to as the Radar Analysis Visual Suite (RAV).

RAV (pronounced rave) is the latest in radar analysis software to be developed by AOS, specifically as a 32 bit, multi-tasking application, that works on Windows™3.1 platform with the WIN32S extension. RAV works best on the Windows™95/NT platforms. RAV will interpret and analyze prerecorded radar data files providing graphical and statistical summaries to assist radar analysts to maintain the various radar sensors in the FAA's inventory.

What is RAV?

The RAV is a project in development by the FAA's Operational Support Service (AOS) Radar Analysis Group. RAV will eventually replace all existing FAA radar analysis software tools (En Route and Terminal). RAV is intended to be the first generation of Windows™ based radar analysis tools that take advantage of the user-friendly graphical user interface (GUI) of the Microsoft Windows™ environments as well as the standard output devices supported by Windows™. As a tool of this environment, standard output devices such as printers and displays can be supported without the need for customizing the software for specific printers or display types and drivers.

Why RAV?

The history of radar analysis has been a bleak one until the advent of the personal computer. Computing speeds, disk access, and display quality has drastically improved. The Graphical User Interface or GUI such as Microsoft Windows™ has made user friendly and standardization within the PC environment available to users of varying degrees of expertise.

Standardization within radar analysis software was drastically lacking. Software programs had been developed for multiple platforms and operating systems such as UNIX, DOS, Windows™, RISC, 80XXX, 680XX, Workstations, mini-computers, etc.. Most programs were unuser-friendly and were extremely difficult to use. Many programs were developed by radar analysts and thus lacked the finesse and forethought required for novices to the radar analysis function and assumed the expert level analyst to be the end user..

When will it be completed?

Due to limited resources (staffing) RAV took several years to develop. RAV will be delivered in phases. The first ALPHA release was delivered to a limited group of FAA personnel October 1st 1997. The official release should be delivered around early 1998. A core consisting of a common radar format, Radar Data Interface (RDI), along with common file I/O, memory routines, a RAPPI display, and a Horizon display is currently near completion. The initial phase of delivery will attach two or three applications that are severely needed. These applications are Beacon False Target Analysis and Surveillance Analysis.

Other applications from existing programs will continue to be enhanced, converted, standardized, and improved upon. Most applications will be converted to C++.

Tip: Check out the radar analysis page on the FAA Intranet AOS Web site at <http://www.aos.tc.faa.gov/aos270/>.

E-RIT Project

The Enhanced - Radar Intelligent Tool (E-RIT) Project is the FAA's PC based continuous radar data recorder system. E-RIT is designed to provide multi-sensor sites (primarily ARTCC's) with PC based radar data recording and analysis tools.

E-RIT System Hardware

An E-RIT System consists of two commercial off the shelf personal computers, both Windows compatible. One PC is the E-RIT/Recorder and the second PC is the E-RIT/Analyzer.

E-RIT/Analyzer

The E-RIT/Analyzer is a RIT System with the addition of a single optical drive. The E-RIT/A is used by site personnel to analyze pre-recorded radar data files recorded on the optical disk using the FAA RIT Analysis Tools.

Software required:

System operation (COTS):

1. MS DOS
2. SCSI device drivers
3. MS Windows™3.1

Management reports (COTS):

1. MS Word v6.0
2. a screen capture utility for including screen images in reports

Radar Analysis Tools (GFE):

1. TRACS-9 software suite - DOS based
2. **NEW!** RAV - Radar Analysis Visual suite

E-RIT/Recorder

The E-RIT/Recorder is a commercial off the shelf personal computer with two optical drives and one or more radar data capture boards (the Radar Data Interface System).

The E-RIT/R provides the means of capturing all radar data products using one or more RDI Systems to record radar data to an optical drive or any PC secondary storage medium (hard drives, LAN based drives, removable media drives, etc.). The removable optical disk containing the pre-recorded radar data, is then analyzed on the E-RIT/A.

Software required:

System operation (COTS):

1. MS DOS
2. SCSI device drivers
3. MS Windows™3.1

Radar Analysis Tools (GFE):

1. RDI Recording Program

Radar Data Capture Boards

In order to record radar data using a PC, a radar data capture system must be employed. The FAA has employed several types of PC compatible radar data capture systems in the past. Currently, the FAA has standardized on the MX-6A Card and the newly developed RDI System. Following is a brief discussion of both systems, site users should refer to the respective reference manuals for a more in-depth discussion.

MX-6A Card System

The MX-6A Card is designed to capture most radar data products, making them available for real-time display or storage. The MX-6A can capture six channels of synchronous serial radar data for display or recording on the PC.

The MX-6A Card is designed to be a passive, non-intrusive radar data interface and is currently used by the FAA, the U.S. Air Force and several other government organizations at operational sites. The MX-6A is used in the RIT System for radar data recording and analysis.

The MX-6A is designed to operate in an 8/16/32 bit AT bus slot using interrupts to notify the PC that data is available for display or storage. The MX-6A can accept RS-232, RS-422 or TTL type input signals with a maximum throughput of 9600 baud of data.

The on board firmware and the PC program (currently DOS based) are selected dependent on the application. PC programs record the radar data in data files on the PC's secondary storage devices (such as a hard drive, an optical drive, or network drive).

RDI System

The Radar Data Interface (RDI) System is designed to capture all the radar data products, making them available for real-time display or storage. The RDI System comprises three hardware components: the RDI Board, the RDI Cable and the RDI Adapter box.

The RDI System is designed to be a passive, non-intrusive radar data interface and currently used by the FAA and U.S. Air Force at operational sites. Both RIT and E-RIT Systems will use the RDI System for radar data recording, analysis and playback.

RDI Board

The RDI Board (RDIB) is a 16 bit PC AT (ISA) bus card which can capture or transmit eight channels of synchronous serial radar data for display or recording on the PC. It is designed to operate in a 16/32 bit AT bus slot in a 80386 or better PC. The RDI Board receives and transmits TTL level signals up to 19.2K baud per channel to its single DB44 high density connector.

The RDI Board hosts a Motorola MC68000 microprocessor, 768 Kbytes of onboard RAM, 4 Kbytes of dual ported RAM and an eight serial port VLSI chip. The RDI Board receives and transmits TTL level signals up to 19,200 baud per channel to its single DB44 high density connector.

The PC and RDI Board communicate via the PC polling the RDI Board to verify if there is data present. Each and every radar message is transferred in upto 2000 byte blocks. Radar idle messages are counted.

RDI Cable

The RDI Cable (RDIC) is a 50 conductor twisted pair shielded cable with high density DB44 connectors on both ends. The RDI Cable connects the RDI Board with the RDI Adapter Box.

RDI Adapter

The RDI Adapter (RDIA) hosts RS232 and RS530 transceivers to convert the radar data signals to TTL levels compatible with the RDI Board for each of the eight radar channel interface ports. The RDIA connects to the RDI Board via the RDI Cable and provides a hardware interface for cables connected to the radar data source.

Radar Data Recording Software

MX-6A Recording Software

The MX-6A has a multitude of unique software applications which receive the radar data from the card and process it. There is no one MX-6A software standard. The MX-6A has no playback capability.

RDI Recording Software

The RDI Recording Software is a Microsoft Windows application allowing site personnel to customize/configure (radar type, site designator, file type, etc.) the RDI System recording or playback configuration.

Radar Sensor Interface Cables

The RIT / E-RIT System requires interface cables designed to connect the radar data source with the RIT / E-RIT data capture system. The interface cables should be shielded plenum rated cables designed to be installed under the floor at each site.

Using various interface cable designs, the MX-6A or RDI can interface to a variety of radar sensors (CD-1, CD-2, ARSR-3, ASR-9, Mode-S, and FPS-117). For additional information on the MX-6A Card, RDI System or the applicable cables designs, refer to the MX-6A Users and Technical Reference Manual or the RDI System Users and Technical Reference Manual.

Due to the fact that each site is custom configured, cables required to interface the MX-6A Card or RDI System with a specific radar data source is the responsibility of the site user.

NOTE: AOS-500 has cable designs for interfacing either system, MX-6A or the RDI System to a variety of radar sensors.

RIT / E-RIT System Deployment

The RIT / E-RIT Systems will not be reflected in the PMSRS. AOS-500 shipped the systems using the OATS Technical Orders and instructed each site personnel to incorporate the hardware systems into their local property custodian lists.

Each shipment included a detailed shipping and inventory document which listed every component included in the shipment. This document listed the serial number and value for each item.

Site users will use their own local bar codes and retain full ownership and custodianship over each system once it arrives at their facility. Bar-coding should be limited to the main components that have serial numbers; e.g., the CPUs, printers, magneto-optical drives, monitors, etc. Items such as the mouse and keyboard need not be bar coded.

Radar Data File Formats

The FAA is standardized on the CD-record message format for all radar data communications. Newly developed radar sensors and any upgrades or enhancements to existing sensors have the capability to provide much more data than just primary and secondary radar message formats. These sensors require special consideration in the standard CD-record formatted files.

CD-record File Format

The CD-record file format is a very rigid and static file format that does not provide for expansion and flexibility. Frequently, various civilian and military organizations require specific groups of data blocks in the CD-record header for comments or special information. These set aside areas are frequently overwritten by legacy software. As new radar sensors and radar messages are required by radar analysts, the CD-record standardization is modified, further exacerbating the legacy radar analysis software compatibility problem.

RDI File Format

AOS has, in conjunction with the Air Force, developed and established a new radar data file format designated, the Radar Data Interface (RDI) File Format. The RDI File Format provides more dynamic and flexible data storage capabilities for post analysis functions. Conversion programs to convert legacy file formats to the RDI format are currently under development at AOS-500 and the Air Force. A RDI recording driver (DOS and Windows) for use with the MX-6A Card is under development to promote the RDI standard.

Electronic Documentation

AOS-500 in conjunction with the FAA's Gemini Team, is developing electronic documentation products and procedures in an effort to shorten and reduce the technical documentation production, delivery and maintenance time and costs while making the information more user friendly and accessible. This effort, as it pertains to RIT and the E-RIT Project is called, the Electronic Book Technology (EBT) Project.

The EBT Project's objective is to host on-line, all pertinent technical documentation on compact disc-read only memory (CD-ROM) media. A Microsoft Windows™ compatible hypertext viewer (SGML compliant) will be used to view the information (text and graphical) on-line allowing the user to perform text based searches for specific topics, allowing the user to make notes and remarks electronically, and permit viewing schematics and printing hardcopies when necessary.

The EBT Pilot Project: Mode-S

The EBT Project will start with the Mode-S System technical documentation manuals and handbooks as the pilot system. All pertinent Mode-S technical documentation, schematics, diagrams, figures, tables and checklists will be hosted on CD-ROM media with hypertext links. As the EBT Project evolves, AOS will be establishing electronic media and hypertext development methodologies and techniques for long term documentation configuration management and maintenance.

These documents will be available to site personnel via the EBT hypertext viewing system, Worldview, included with each CD-ROM delivery. Ad-hoc searches via a full-text search engine will be available by subject, by topic, or by document for review of technical details while on-line or can be printed in hardcopy format. The hardware platform designated to host the EBT System is the RIT System.

EBT & RIT

Each RIT System will host a CD-ROM drive and a super VGA monitor to view the hypertext documents. A black and white 11"x17" bubblejet printer will provide hardcopy output capability for text as well as graphical schematic diagrams.

All of the field installed RIT Systems will be upgraded to meet the minimum EBT configuration. The upgrade as it pertains to the RIT System is referred to as the RIT System EBT Upgrade.

EBT & E-RIT

Each E-RIT/A System will host a CD-ROM drive and a super VGA monitor to view the hypertext documents. A black and white 11"x17" bubblejet printer will provide hardcopy output capability for text as well as graphical schematic diagrams. The RIT System EBT Upgrade will be included with the E-RIT System deployment.